

## WHAT IS CLAIMED IS:

1 1. An arrayed waveguide grating, comprising:  
2 a substrate;  
3 a first channel waveguide disposed on the substrate;  
4 a channel waveguide array disposed on said substrate and  
5 constituted in such that each length of waveguides is sequentially  
6 longer with a predetermined difference in lengths of the  
7 waveguides;  
8 a first slab waveguide disposed on said substrate and  
9 connecting said first channel waveguide with said channel  
10 waveguide array;  
11 a second slab waveguide disposed on said substrate and  
12 connecting an end of said channel waveguide array on the side  
13 wherein said first slab waveguide has not been connected thereto  
14 with an end thereof; and  
15 a second channel waveguide disposed on said substrate and  
16 connected to the other end of said second slab waveguide wherein  
17 a waveguide part in the connected area has a parabolic  
18 configuration.

1 2. An arrayed waveguide grating, comprising:  
2 a substrate;  
3 a first channel waveguide disposed on the substrate;  
4 a channel waveguide array disposed on said substrate and  
5 constituted in such that each length of waveguides is sequentially  
6 longer with a predetermined difference in lengths of the  
7 waveguides;

8       a first slab waveguide disposed on said substrate and  
9       connecting said first channel waveguide with said channel  
10      waveguide array;

11           a second slab waveguide disposed on said substrate and  
12   connecting an end of said channel waveguide array on the side  
13   wherein said first slab waveguide has not been connected thereto  
14   with an end thereof; and

15 a second channel waveguide disposed on said substrate and  
16 connected to the other end of said second slab waveguide wherein  
17 a waveguide part in the connected area has a configuration as a  
18 multi-mode interference in which a width of optical waveguide  
19 changes step-functionally and discontinuously.

1            3. An arrayed waveguide grating, comprising:

2           a substrate;

3 a first channel waveguide disposed on the substrate;

4        a channel waveguide array disposed on said substrate and  
5        constituted in such that each length of waveguides is sequentially  
6        longer with a predetermined difference in lengths of the  
7        waveguides;

8           a first slab waveguide disposed on said substrate and  
9   connecting said first channel waveguide with said channel  
10 waveguide array;

11 a second slab waveguide disposed on said substrate and  
12 connecting an end of said channel waveguide array on the side  
13 wherein said first slab waveguide has not been connected thereto  
14 with an end thereof; and

15 a second channel waveguide disposed on said substrate and

16 connected to the other end of said second slab waveguide wherein  
17 a waveguide part in the connected area has a rectangular field  
18 distribution exciting configuration that excites a rectangular  
19 field distribution.

1           4. An arrayed waveguide grating as claimed in claim 1,  
2   wherein:

3        said parabolic configuration is individually adjusted in  
4        response to respective wavelengths of multiplexed optical signals  
5        input to said first channel waveguide.

1           5. An arrayed waveguide grating as claimed in claim 2,  
2    wherein:

3        said configuration as a multi-mode interference is  
4        individually adjusted in response to respective wavelengths of  
5        multiplexed optical signals input to said first channel waveguide.

1           6. An arrayed waveguide grating as claimed in claim 3,  
2   wherein:

3           said rectangular field distribution exciting configuration  
4   is individually adjusted in response to respective wavelengths of  
5   multiplexed optical signals input to said first channel waveguide.

1           7. An arrayed waveguide grating as claimed in claim 3,  
2    wherein:

3        said rectangular field distribution exciting configuration  
4        is such a configuration that an angle  $\theta_w$  defined by a boundary part  
5        of an outputting channel waveguide in a starting point from which

6 a width of waveguide changes and a central axis of the waveguide  
7 has a value larger than zero degree and smaller than ninety degrees,  
8 and tapered configurations are excluded from these resulting  
9 configurations.

1 8. An optical communication system, comprising:

2 an optical transmission means for delivering optical signals  
3 having respective wavelengths in parallel;

4 a multiplexer composed of arrayed waveguide gratings for  
5 subjecting the optical signals having the respective wavelengths  
6 delivered from said optical transmission means to wavelength  
7 division multiplexing;

8 an optical transmission line for transmitting the optical  
9 signals which have been wavelength division-multiplexed and output  
10 from said multiplexer;

11 nodes each provided with an arrayed waveguide grating dis-  
12 posed properly in the middle of said optical transmission line;

13 a demultiplexer composed of an arrayed waveguide gratings to  
14 which optical signals delivered through said nodes disposed on said  
15 optical transmission line are input to separate into each of  
16 optical signals having respective wavelengths; and

17 an optical receiver for receiving optical signals having the  
18 respective wavelengths separated by said demultiplexer;

19 each of said arrayed waveguide gratings being composed of a  
20 substrate; a first channel waveguide disposed on the substrate;  
21 a channel waveguide array disposed on said substrate and  
22 constituted in such that each length of waveguides is sequentially  
23 longer with a predetermined difference in lengths of the

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24 waveguides; a first slab waveguide disposed on said substrate and  
25 connecting said first channel waveguide with said channel  
26 waveguide array; a second slab waveguide disposed on said substrate  
27 and connecting an end of said channel waveguide array on the side  
28 wherein said first slab waveguide has not been connected thereto  
29 with an end thereof; and a second channel waveguide disposed on  
30 said substrate and connected to the other end of said second slab  
31 waveguide wherein a waveguide part in the connected area has a  
32 rectangular field distribution exciting configuration that ex-  
33 cites a rectangular field distribution.

1 9. An optical communication system, comprising:  
2 an arrayed waveguide grating having a circular transmission  
3 line prepared by connecting circularly a plurality of nodes by  
4 means of transmission lines and transmitting optical signals which  
5 have been wavelength division-multiplexed to these transmission  
6 lines, and separating the wavelength division-multiplexed optical  
7 signals into optical signals having respective wavelengths; and  
8 an arrayed waveguide grating for wavelength division-  
9 multiplexing optical signals, which have been separated into those  
10 having respective wavelengths;  
11 each of these respective arrayed waveguide gratings being  
12 composed of a substrate; a first channel waveguide disposed on the  
13 substrate; a channel waveguide array disposed on said substrate  
14 and constituted in such that each length of waveguides is  
15 sequentially longer with a predetermined difference in lengths of  
16 the waveguides; a first slab waveguide disposed on said substrate  
17 and connecting said first channel waveguide with said channel

18 waveguide array; a second slab waveguide disposed on said substrate  
19 and connecting an end of said channel waveguide array on the side  
20 wherein said first slab waveguide has not been connected thereto  
21 with an end thereof; and a second channel waveguide disposed on  
22 said substrate and connected to the other end of said second slab  
23 waveguide wherein a waveguide part in the connected area has a  
24 rectangular field distribution exciting configuration that ex-  
25 cites a rectangular field distribution.

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